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ABSTRACT

This study focused on the psychophysiological reactions of viewers seeing such selected cinemagraphic elements as varying camera distances, tracking shots, panning shots, and zooming shots. Subjects (N=29), randomly selected from introductory speech courses, viewed five films that varied in the presence or absence of the selected filmic elements. While the subject viewed the films, physiological measurements (GSR and respiratory rate) were taken. The subject then completed a semantic differential that measured the subject's perception of production and story-line concepts. A second study, composed of students in graduate level audiovisual courses (N=29), was conducted to replicate the results of the first study. The results of both studies indicated that there were significantly greater psychological responses with production concepts than with story-line concepts. The control film, which was composed of static long shots, was the locus of this variance, and also elicited significantly more physiological responses than the other filmic elements. The results of this study indicate that the absence or presence of certain filmic elements can greatly influence the psychophysiological responses to a film and that changes in the production of a film will have little effect on the comprehension of that film's story. (Author/VT)

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THE PSYCHOPHYSIOLOGICAL REACTIONS OF FILM VIEWERS WHILE VIEWING SELECTED CINEMAGRAPHIC ELEMENTS

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Rationale

The cinema has operated, and continues to operate as a highly sophisticated communication system. Like other systems, the cinema is composed of the basic components of the sender, the message, and the receiver. In cinemagraphic communication, the film producer (the sender) selects film images (the message). These film images are transmitted to the audience (the receiver). The effectiveness of the cinematic message is determined by the ability of the film producer to select film images that can be adequately interpreted bt the audience.

In the past, the selection of these images has been arbitrary, since no lexicon has existed to aid in the selection of the cinemagraphic elements. A film producer has, instead, selected images based on his aesthetic judgement, genre requirements, and technical limitations. This, in all probability, has led to the production of cinemagraphic events that may have communicated but did not satisfy the specific communicative requirements of the film producer.

To meet his requirements, the film producer needs to know how certain images or techniques affect an audience. Research could determine the types of reactions that occur during the viewing of a cinematic event. Knowing these reactions, the film producer could create motion pictures for specific audience reactions. This in turn, could lead to the systematic design of the cinemagraphic event for specific communicative needs.

Although substantial research has been conducted on the cinemagraphic event, the process of filmic communication has been analyzed only superficially (Pryluck & Snow, 1967). Fundamental to this process of filmic communication is the selection and arrangement of the filmic images, as they operate in the communication system, and can lead to new insights

in cinemagraphic communication and film design. The problem faced by the film theorist, however, is the selection of an appropriate research methodology to analyze these filmic elements as they operate within the communication system (Worth, 1968b).

The methodological problem is accentuated by the fact that what has been commonly referred to as the "cinema" is, in reality, a vast and complex sociocultural phenomenon (Metz, 1974). The cinema is also a multi-dimensional structure that includes financial, psychological, social, technical, and many other elements. The cinema can, therefore, lend itself to a variety of analytical approaches, but, as Metz (1974) has stated, can defy any rigorous and unified form of study.

The process of filmic communication, of course, is a small portion of the total cinemagraphic phenomenon. To identify a proper research methodology, one has to note that filmic communication operates within the confines of cinemagraphic language (Worth, 1968b). This naturally leads the film research to the discipline of linguistics as a means to analyze this cinemagraphic language (Wollen, 1969).

Most film analysts have approached a linguistic study of film through the observation of the film image. The film image has been considered important in that most messages or meanings have been transmitted by it (Wollen, 1969). The film image, however, has not been equated to the written or spoken word (Wollen, 1969). Instead, the filmic image has been a highly specialized sign in its language system (Bettetini, 1973). The presence of a sign in the cinemagraphic language is of extreme importance to the film analyst. Filmic signs allow the research to add to his linguistic techniques the more inclusive semiotic approach (Worth, 1968b).

C.S. Peirce has developed a "semiotic system which has been a general language for all extant languages or signs (Morris, 1971). The significance of Pierce's conception to the film theorist has been the inclusion of nonverbal signs into the language system (Wollen, 1969). Of these signs, the trichotomy of the icon, the index, and the symbol has been the basis of many of Peirce's semiotic theories and has been the foundation of any advances in filmic research (Buchler, 1955; Wollen, 1969). Analyzing these signs, the film theoriest has studied the process of cinemagraphic communication (Metz, 1974).

Expanding Peirce's semiotic approach, Morris (1971) included behavioristic concepts in the sign system. In doing that, Morris felt that signs have reacted with other signs and with the receptors of those signs. To study such reactions, Morris developed three strategies, the syntactic, the semantic, and the pragmatic strategies.

Of those three strategies, pragmatics holds the most interest to some film theoreticians. Basically, pragmatics studies the sign to interpreter relationships. Furthermore, pragmatics, being generated from behavioristic concepts, views the communication process as a biological event:

> The interpreter of a sign is an organism; the interpretant is the habit of the organism to respond, because of the sign vehicle . . . The response to things is thus biological . . . (Morris, 1971, p. 45)

This means, of course, that any semiotic study, or pragmatic study will depend on data from psychological measurements (Metz, 1974).

The cinemagraphic phenomenon has also been inextricably tied to biological reactions, specifically to the psychological mechanism of perception (Metz, 1974).. This has led many film researchers into assuming

that the cinemagraphic language can be studied by making biological measurements during the communication process. Within the field of semiotics, film researchers have turned to a new methodology that analyzes some of the biological responses to a language system (Worth, 1966). This methodology is psycholinguistics.

The psycholinguistic approach, according to Pryluck and Snow (1967), follows two strategies in the research of the cinemagraphic language. The first approach is through the logical analysis of the grammar of the cinematic language. The second approach, empirical analysis, tends to use the concepts of Morris' pragmatics to study viewer relationships to the film medium. The empirical approach, according to Pryluck and Snow (1967), relies on psychophysiological measurements to acquire substantial information on audience reactions to changes within the film medium.

To begin a study of the cinemagraphic language by "pragmatic" or psycholinguistic means, one should first isolate any possible elements within a film for analytical purposes. A film has two sources of possible filmic elements. A film operates as a technico-sensory phenomenon: technical in terms of production and transmission; sensory in terms of reception by the viewer (Salomon & Snow, 1968). The technical elements, therefore, can be used as independent variables in a "pragmatic" study of the sensory responses to a film.

From the technical aspect of the film medium, the basic unit of the film is its filmic image which is also the basic unit of the cinemagraphic language (Worth, 1968a). All technical manipulations, such as cotextual and ordinal arrangements, are made with the filmic image. To find those filmic images to be used as independent variables, one must to turn to the work by Worth (1968a). Worth feels that the filmic image, or the videme, can be

separated into two basic units, the cademe and the edeme. The cademe is a continuous strip of exposed cinemagraphic film. The edeme, however, is the edited version of this continuous shot. Worth feels that the edeme is the basic building block of the cinemagraphic language. The edeme, therefore, should be the unit one studies in this language system.

The number of edemes available to a film producer to create a filmic message is totally dependent on his intentions and capabilities (Bettetini, 1973). There are, however, a limited number of "general cinematic codes" or elements that are present in all films (Metz, 1974). The elements include any cinemagraphic, contextual, or ordinal technique available to the film producer. Traditionally, "pragmatic" research on film has been confined to the contextual and the ordinal elements (Isenhour, 1975). Other cinemagraphic production elements have not been studied to the extent of the sequential arrangements of edemes.

Psychological studies. The majority of psychological studies on cinemagraphic elements have been conducted on contextual and ordinal elements, the arrangement of individual shots into a sequence. The classical study in this area has been the work produced by Kuleshov and Pudovkin (Isenhour, 1975). In a series of experiments, these Russian film pioneers were able to demonstrate that the context of a shot and the order in which a shot was positioned would have an effect on the interpretation of that scene (Pudkovkin, 1958). In a later study, Goldbert (1951) verified much of the work done by these Russian film theorists.

In his study on the sequence in films, Worth (1968a) hypothesized laws of cognitive sequence in a film language. Building upon the work of Kuleshov and Pudovkin, Worth attempted to apply mathematical concepts to filmic sequencing. Studies by Worth (1968a) and Gregory (1961) indicated

that two juxtaposed shots are united contextually by visual cues within a particular shot. The presence of these cues would greatly effect the audience's interpretation of a montage.

Although sequential studies have been the most prevalent topic in psychological research on viewing filmic elements, other elements have been studied. Specifically Williams (1968) studied the effects of varying camera distances on the interest levels of an audience and Miller (1969) analyzed the effect of motion on affective responses of an audience. Neither study demonstrated a significant psychological response by an audience to these filmic elements.

Physiological studies. From a review of the available literature, a lack of research on the physiological reactions to viewing filmic elements became apparent to this investigator. Of the film studies reviewed, the consensus was that the galvanic skin response (GSR) was the most reliable measurement of the physiological reactions to the stimulus of a film (Dysinger & Ruckmick, 1933; Lazurus, Speisman, Mordkoff, & Davidson, 1962; Kaiser & Roessler, 1970).

Of those studies concerning filmic elements, most measurements have been made on the psychological variables. In a previously cited study, Miller (1969) found, however, that subjects viewing a film exhibited a higher GSR activity than when they viewed a filmograph. These results, however, were not statistically significant.

The data concerning the psychophysiological reactions to the viewing of cinemagraphic elements has been superficial. Of those studies available to the investigator, relatively little could be stated about these reactions. These studies, however did reveal that it was experimentally possible to conduct a psychophysiological analysis of a viewer's reactions to cinemagraphic elements.

Purpose

Because of the lack of research, the purpose of this study was to analyze a viewer's psychophysiological reactions to seeing the selected cinemagraphic elements of varying camera distances, tracking shots, panning shots, and zooming shots. If such reactions existed, this study would also determine whether or not correlations existed between the psychological and the physiological reactions to viewing those elements. This study also determined whether or not the gender and the film viewing experience of the subjects had an effect on the observed reactions.

In order to answer question proposed in this study, null hypotheses were formulated so proper tests of significance could be applied to determine whether significant main effect or significant interaction effects existed in the responses and to determine whether significant correlations existed between the psychological and the physiological responses.

The following hypotheses were tested by means of an analysis of variance with repeated measures at the .01 level of significance:

1. There were no significant main effects nor any significant interaction effects, as measured by a semantic differential, in the psychological responses to the independent variables of the filmic elements.
2. There were no significant main effects nor any significant interaction effects, as measured by the frequency responses of the galvanic skin response and the pneumographic reaction, in the physiological responses to the independent variables of the filmic elements.

The following hypothesis was tested by means of the Spearman's coefficient of rank correlation at the .01 level of significance:

3. There was no significant correlation between the psychological responses and the physiological responses to the individual treatments of varying camera distances, panning shots, tracking shots, and zooming shots.

Procedure

This study was composed of two independent investigations. The first investigation was designed to determine if a relationship existed between the psychophysiological reactions of film viewers and certain filmic elements. After this initial investigation, the second study was conducted to attempt replication of some of the observed phenomenon.

Subjects. The subjects for the first part of this study were selected from various sections of Speec 100, a lower division course in the Department of Speech Communication, Northern Illinois University. Students enrolled in this section are randomly assigned to the different sections. A random sample of subjects was selected from a pool of students indicating a desire to participate in the study. The total number of subjects was twenty-nine.

The subjects involved in the second investigation were selected from two sections of Education 570 and Education 571, graduate level courses in the Department of Education, Purdue University - Calumet Campus. A random sample of subjects was selected to participate in the study. The total number of subjects was twenty-nine.

In both investigations, the subjects were assigned to a treatment session that was scheduled according to a complex Latin square design. This design allowed all subjects to be tested on all filmic elements.

Since the order of presentation of the filmic elements was systematically counterbalanced, this variable was considered to be controlled.

Apparatus. The variables identified in the research hypotheses required the development of five separate films. This necessitated the preparation of five scripts that varied only in the presence or absence of the four filmic elements. A script for the control film was prepared and served as a model for the uniform development of the subsequent scripts. The five motion pictures were then produced using super 8mm motion picture equipment.

Pre-treatment measurements. In the first investigation, the subjects were questioned as to their sex and their viewing habits. This data allowed the investigator to separate the group according to sex and to film viewing experience. Film viewing experience was operationally defined as $\pm$ 1 standard deviation from the group's average monthly viewing rate to be medium film viewing experience and the high and low groupings were above or below that mark.

Treatment measurements. To obtain the psychological measurements, the development of a semantic differential was required. Osgood's procedures were followed in developing concepts that were or were not affected by the filmic elements and a scale with appropriate bipolar adjectives was created for the concepts (Osgood, Suci, & Tannenbaum, 1957). The concepts were separated into two groups. The first group of concepts related to production aspects of a film and the second group was related to the story-line of the film.

Physiological measurements were made by connecting the subject to a Keeler polygraph, Model 6303. This instrument made continuous measurements during the treatment session of the subject's galvanic skin reactions

and pneumographic reactions. These measurements were transformed into interval data by a quantitative analysis of the frequency of responses.

Treatment session. For the first investigation, the treatment session was divided into three parts. These included verbal information to the subjects, instructions for the semantic differential, and the treatment session itself.

The subject, upon entering the treatment room, was directed to take a seat facing the viewing screen. The investigator welcomed the subject and explained the purpose of the study, the types of physiological measurements that would be taken, and the absence of any possible harm to the subject. The investigator explained the procedures used in completing the semantic differential, and the subject was given an example. The subject was asked if he had any questions, and those questions were answered to the best of the investigator's abilities. Connections of the subject to the polygraph were made. The polygraph was started, and a base level reading was made of the subject's physiological activity. The lights in the testing room were dimmed, and the treatment session began.

The treatment session consisted of the following: The subject viewed the first film in his assigned sequence. During this period, the physiological measurements were made. At the end of the film, the light were raised, and the subject was partially disconnected from the polygraph. The subject was given the semantic differential for that particular film, and he was instructed to complete the form. When the subject was finished, the form was collected, reconnections to the polygraph were made, the lights were dimmed, a new base level reading was made, and the subject was shown the second film in his sequence. This procedure was continued until the

subject viewed all five films and completed all five semantic differentials.

In the second investigation, an attempt was made to replicate the psychological reactions observed in the first study. All procedures in the treatment session were identical except that no physiological measurements were made. In addition, no attempt was made in the second study to determine the relationship of sex and film viewing experience to the psychophysiological reactions of the subjects.

Results

During the sampling procedure for the first study, data were collected on the subjects to determine their position in the variable groupings used in the study. The mean film viewing experience for this group was eleven films per month. The standard deviation was seven.

The psychological data were separated into evaluative and dynamism factors of the semantic differential and were analyzed by an ANOVA with repeated measures for the first study. Since sex and film viewing experience groupings were not used in the second study, the results were analyzed by a one-way ANOVA.

The variables of sex and film viewing experience generally did not elicit significant reactions in the first study. The only interaction effect occurred in the dynamism factor of the concept Color, (F (4,92) = 4.18, $p \leq .01$.) Further analysis of this result indicated that the loci of this interaction occured differentially among the film treatment. Based on this result, the investigator decided not to study these variables in the second study.

In the first study, main effects were found in three different concepts. The evaluative factors of the concepts Screen Area and Camera Movement were found significant, (F (4,92) = 3.40, $p \leq .01$; F (4,92) = 6.03, $p \leq .01$). The dynamism factors of the concepts Direction and Camera Movement were found significant, (F (4,92) = 3.67, $p \leq .01$; F (4,92) = 4.54, $p \leq .01$). Duncan's Multiple Range Test indicated that the locus of these variances was in the control film for all concepts. None of the concepts that dealt with the story-line of the film were found to have significant results.

In the first study, the physiological reactions were varied. There were no significant differences in the respiratory rates of the subjects. The GSR, however, did exhibit a significant treatment effect, (F (4,92) = 4.27, $p \leq .01$). A Duncan's Multiple Range Test indicated that the locus of this variance was located in the control film.

Based on these results, a second study was conducted to attempt replication of the psychological reactions. The evaluative factors of the conepts Screen Area and Speed-Tempo were found significant, (F (4,92) = 4.07, $p \leq .01$; F (4,92) = 4.09, $p \leq .01$). The dynamism factors of Camera Movement and Speed-Tempo were found significant, (F (4,92) = 6.53, $p \leq .01$; F (4,92) = 4,93, $p \leq .01$). A Duncan's Multiple Range Test indicated that the locus of these variances was in the control film. As in the first study, no story-line concepts elicited any significant reactions to the film treatments.

The correlations made in the first study represented the different combinations of the four psychophysiological measurements: Evaluative-dynamism factors and pneumographic-GSR reactions. In general, the data

indicated that the tracking film exhibited four significant correlations or one-half of the total significant correlations. The zooming film had no correlations and the remaining films had one or more significant correlations. The data did not indicate any one particular psychophysiological combination to be highly correlative. Basically, the correlations for all combinations were highly variable and displayed no significant trends.

Discussion

This study was initiated because previous research did not adequately analyze a viewer's psychophysiological reactions during cinemagraphic communication. The results of this study indicated that certain phenomena exist. The results, however, are quantitative in nature in that no attempt was made to see how these filmic elements operate in this particular communication process. Although qualitative research will have to be conducted, the results of this study still hold some importance to the film producer.

Basically, this study was designed to identify two psychological changes in the viewer's perception of a film. First, the semantic differential was composed of concepts that involved cinemagraphic production. Secondly, storyline concepts were included in the differential to identify changes in a viewer's perception of the film's story. The results indicate that the former concepts elicit more significant responses than do the story-line concepts.

In this investigation, the subjects were aware of the different changes in production techniques. That is, they perceived changes in the filmic elements and this affected their semantic space in production concepts. These filmic elements, in contrast, did not cause these variances in the story-line concepts. In general, the subjects, recognizing changes in production techniques, did not register corresponding changes in their

perception of the story. Instead, the subjects perceived the storyline to be homogenous in all film treatments.

Another unique psychological phenomenon was the source of the reaction. In all instances of significant reactions in production concepts, the locus of the reaction was the control film. This seems to indicate that greater psychological reactions can occur through the absence of these particular film techniques.

The physiological reactions exhibited a similar phenomenon in that greater GSR responses occurred in the control film than in the filmic elements. Conclusions based on these results may, however, be premature. The polygraph that was used in the study was not extremely sensitive and the lack of reactions to the film treatments may have been caused by a slow reaction time of the polygraph.

In a broad sense, the results of this study have some important implications to the film producer. Generally, film producers have operated under the assumption that a viewer's perception of a film's story can be manipulated through cinemagraphic techniques. This assumption probably is based on the research done by the Russian film theorists. The concept of montage, the physical manipulation of the basic units of film to create new psychological perceptions, has probably created an attitude in film producers that any technical change in a film will create new perceptions in a viewer's mind. The results of this study do not concur with that assumption.

The results of this study seem to indicate that a film viewer will perceive a filmic event at two independent levels. First, a viewer is

psychophysiologically aware of changes within the technical aspects of film. A viewer has a certain amount of "film literacy" that enables him to understand that technical manipulations are physical in nature and do not, at least with these filmic elements, affect the film's story. Secondly, a film viewer is aware of the story-line of a motion picture and this story-line is perceived as a separate communicative entity, greater than the influence of its production elements.

In view of the results of this investigation, a film producer should be concerned with the selection and use of filmic elements in the production of a motion picture. Although this study demonstrated that production elements are viewed differently than story-line concepts, the unique aspect of this study was that the locus of this variance was in the control film. In addition, the locus of the physiological variance was also in the control film. The results seem to indicate that a film producer, wanting to create the greatest amount of psychophysiological responses to his film, should utilize a static long shot in the production of the film. Before such broad statements can be made, however, further qualitative research needs to be conducted to see exactly how these variables operate in this communicative process.

Conclusions

As stated before, the purpose of this investigation was to analyze the psychophysiological reactions of male and female subjects with varying film viewing experience to the selected filmic elements of varying camera distances, panning shots, tracking shots, and zooming shots. The results indicate that with this group of subjects:

1. Greater psychological reactions will occur in the absence of these filmic elements than in their presence.

2. Viewers will psychologically respond to production aspects of a film, but these techniques will have no influence over their reaction to the film's story.
3. Greater physiological reactions will occur in the absence of these filmic elements than in their presence.
4. The gender and the film viewing experience of a viewer will have little effect on his psychophysiological reaction to these filmic elements.
5. There is little correlation between the psychological and the physiological responses to these filmic elements.

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